PHYSIQUE AND CHOICE OF CAREER*

By J. M. TANNER, M.D., Ph.D., D.P.M.

Introduction

VERY many considerations enter into the choice of a career. There is the family expectation, bound up with social prestige and financial reward. There is the inspiring example of an admired figure, whether artist, scientist, money-spinner, craftsman, teacher or criminal. There is the recognition during the educational period of special latent abilities, making success in some careers more probable than in others. There is also, and most importantly, the desire to lead one sort of a life rather than another, a desire which springs from sources within the individual. Entrants to a life-long career match up the demands of their temperament with the opportunities for satisfying these demands that their projected role in the community will give them. It is unlikely, for example, that an individual whose prime loves are for physical adventure and social participation will choose a career of librarianship. (The extreme or the perversion of this normal process also occurs, when the needs are psychopathological and complex- rather than instinct- and training-determined; the individual is impelled towards a career which may be highly unsuitable—that is may satisfy his neurotic but not his normal needs).†

With this in mind, it may not seem particularly strange that one of the factors affecting the choice of career is the individual's physique, and more particularly his shape and tissue structure rather than his size. It is this factor, amongst the many, that I wish to talk about, and I should emphasize that the singling out of this one aspect for study and description by no means implies a wish to exalt it in importance over the others. It is a convenient factor to study, it allows of quantitative and objective results, it has some possibility of serving as a link between many of the other factors, in a way I shall discuss later, and it interests me personally : that is all.

So first I shall present evidence, both from my own and other people's studies, that different careers actually do attract persons of different physiques ; then I shall discuss reasons why this should be so, and lastly I shall pass in brief speculation the way in which such choices influence and on occasion change our culture, using that word in the anthropologist's sense.

Comparison of Physiques of Sandhurst Cadets, Oxford University Students and Medical Students

Material. The material that I want to spend most of the time discussing consists of 287 officer cadets of the Royal Military Academy, Sandhurst, constituting the entire intake of March 1952 ; 171 Oxford University students constituting a 50 per cent sample of the freshmen of two colleges in 1949 and 1950 ; and 162 medical students of St. Thomas's Hospital of the University of London, constituting the entire male entry at the preclinical stage for the years 1950 to 1953 inclusive. Thus for the medical students and the officer cadets the sample was a complete one. For the Oxford students it was far from this, and consisted of those who volunteered to attend for examination at the Pilot Student Health Service at that

* A paper read at a Members' Meeting of the *Eugenics Society* on March 24th, 1954.

† What Adrian (1953) has said recently about the factors governing the choice of a medical career is characteristically clear-sighted and unanxious: " Most of us were at school when we decided to become doctors and no doubt we believed that the chief reason for our choice was a praiseworthy desire to look after our fellow men when they were sick. At that age one is not ashamed of generous impulses and has not learnt to question their origin. Few of us now would be bold enough to assert that we can always decide rationally and from the best of motives; we may suspect that we took to medicine to please or spite our parents or because we wanted power over weaker people or for the more prosaic reason that circumstances conspired to push us into it. Yet the fact that there is a good reason for medical work is not to be set aside, and most of us can take comfort in the reflection that in this case at all events our unconscious urges made us choose very sensibly."

time operating there. Such a selection might well be suspected of bias, but at least in the most important respect—that is in the character which most clearly differentiates Oxford students from the other two groups—it was possible to demonstrate for one of the two colleges that no bias occurred.* Briefly, a list of all those who represented the college at some game or other was obtained, with the presumption that these were the people relatively high in mesomorphy, the component of physique apparently lower in this group than in the others. It was then possible to discover whether these games-players had volunteered in deficient or excessive numbers for our study. The statistical result was clear-cut ; the games-players and non-games-players turned up in equal proportions ; games-playing was quite unrelated to volunteering. The second college could not be studied in this way, but as no significant differences in physique occurred between the two colleges, the presumption is that no bias of this sort occurred there either. So that in all probability these 171 students do constitute a relatively unbiased sample of Oxford University students.

Methods. All three groups had their physique assessed in precisely the same way. Some dozen anthropometric measurements were taken, in every case by the same anthropometrist, Mr. R. H. Whitehouse. Photogrammetric photographs were taken,† and the pictures somatotyped by the usual anthroposcopic procedure plus the use of the $\text{Ht.}/\sqrt[3]{\text{Wt.}}$ tables.‡ Miss Barbara Honeyman kindly somatotyped all the pictures as well as and independently of me, and Dr. C. W. Dupertuis also somatotyped a number of them. The results of all three observers agreed closely, and have recently been published in full.§ The final somatotype was agreed between Miss Honeyman and myself, with reference of some cases to Dr. Sheldon. Dealing with this age group, and having access to this expert help, I am in little doubt that the somatotypes are substantially correct. Also all three groups were somatotyped together so that no possibility of bias on going from one group to another occurred. The details of the way in which the physical measurements and the pictures were taken can be found elsewhere.‖ A description of the somatotype classification of physique will be found in Sheldon (1940), and a more recent appraisal of it in Tanner (1953 a, b).

Results

(*a*) *Physical measurements.* A full account of the physical measurements will be published elsewhere ; suffice it to say that there are no significant differences in height between the three groups, but that the Oxford students weigh slightly less than the other two groups, particularly when the effect of age is allowed for. (The mean ages are 18·5 for the cadets, 22·1 for the medical students and 21·0 for the Oxford students, but the range was greater for the medical and Oxford groups, and a small significant increase of weight with age was apparent in the Oxford, but not in the medical students. This small age difference is practically without effect on the other physical measurements and entirely without effect on the somatotypes). There is very little difference between the three groups in gross body size, as estimated by surface area. The officer cadets, however, have wider shoulders and thicker knees and elbows than the two student groups.

TABLE I

MEAN SOMATOTYPE RATINGS FOR R.M.A. OFFICER CADETS, MEDICAL STUDENTS, AND OXFORD STUDENTS (ABOVE) AND DIFFERENCES BETWEEN MEANS (BELOW)

	Endomorphy	Mesomorphy	Ectomorphy
Officer cadets (287)	3·07	4·53	3·68
Medical students (162)	2·85	4·20	3·83
Oxford students (171)	3·27	3·62	3·88
Cadets—Medical	+·22**	+·33**	−·15*
Cadets—Oxford	−·20**	+·91**	−·20*
Medical—Oxford	−·42**	+·56**	−·05

** Significant at 1 per cent level.
* Significant at 5 per cent level.

(*b*) *Somatotypes.* The differences in physique are most succinctly shown by

* Tanner, 1952a.

† Dupertuis and Tanner, 1950; Tanner, 1951; 1953a.

‡ Sheldon, 1940; Tanner, 1953b. § Tanner, 1954.

‖ Tanner and Weiner, 1949; Tanner, 1953a.

the somatotypes, in which very clear-cut distinctions appear.* These are shown in Table 1. All the differences except one are statistically significant. The most striking comparison is of officer cadets with Oxford students; the cadets are much more mesomorphic, and somewhat lower in endomorphy and ectomorphy. The medical students lie

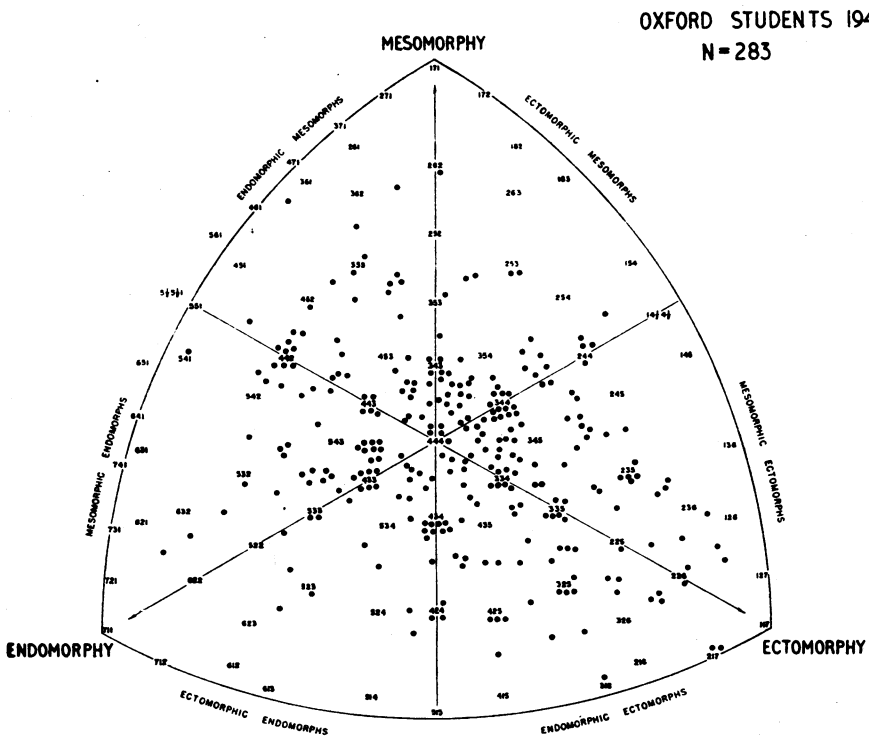

FIG. 1
Somatotype distribution of 283 Oxford University students. (From Tanner, 1953a.)

between the other two groups in mesomorphy; in endomorphy they are lowest. Both student groups exceed the officer cadets in ectomorphy, but do not differ between themselves. The somatotype distributions of the cadets and of a somewhat larger group of Oxford students (obtained under the same circumstances as the 171) are given in Figures 1 and 2, and in Figure 3 both the cadets and the 171 Oxford students are plotted simultaneously. The three components are plotted on triangular graph paper: the preponderance of those high in mesomorphy (at the peak of the triangle) amongst the cadets can be seen by looking at the dotted distributions, and is demonstrated in Figure 3 by the numbers given outside each sector of the triangle.

* In the somatotype classification of body build there are three components, each rated 1 to 7 on a series of criteria. Everybody has some of each component; there are no "types." The components are negatively intercorrelated so that people designated by the three ratings 262 and 253 exist, but not people such as 111, 777 or 266. The first component, called endomorphy, has as its extreme the 711, who is as near spherical as is humanly possible; he has a round head, a large fat abdomen predominating over his thorax, weak, floppy, penguin-like arms and legs, antero-posterior diameters of the body which are relatively greater than those of the other extremes, and usually much subcutaneous fat. The second component, called mesomorphy, has as its 171 extreme the classical Hercules, with bone and muscle predominating, a cubical massive head, broad shoulders and chest, heavily muscled arms and legs and low antero-posterior body diameters. The third component, called ectomorphy, has as its 117 extreme the totally linear man, with a thin peaked face with receding chin and high forehead, a narrow body, spindly arms and legs, and a large skin and nervous system area relative to his size.

Other Authors' Results

There are thus very distinct differences between those who choose a career as Army officers, as doctors or as ex-graduates of Oxford University. Before discussing the reason for these differences, let me draw to your attention various other studies on the same subject, all of which, happily, show a very fair measure of agreement.

Perhaps the most striking of these, and the only one generally available (which Hooton 1948, is not) dealing with normal adults is Garn and Gertler's (1950). In the course of work on the relation of physique and coronary heart disease, Garn and Gertler had occasion to measure and somatotype a sample of 100 healthy men employed in a general factory plant. Of these, twenty were actively concerned with research, either as scientific workers or as technical assistants, while the remaining eighty were in the general plant on various duties, excluding executive and planning ones. Table 2 shows some of the measurements given in the original paper, comparing the two groups.

TABLE 2

DIFFERENCES IN SELECTED MEASUREMENTS BETWEEN TWENTY SUBJECTS WORKING IN A RESEARCH GROUP AND EIGHTY SUBJECTS WORKING IN THE GENERAL PLANT OF A FACTORY. DATA ABSTRACTED FROM GARN AND GERTLER, 1950

Measurement	*Plant*	*Research*	*Difference (R-P)*	*t*
Age	35·2	33·3	−1·9	1·2
Height (cm.)	176·9	179·3	+2·7	2·1
Weight (lb.)	176·6	167·2	−9·4	1·6
Height/Weight	12·4	12·9	+0·5	3·1
Nose length (mm.) ..	56·3	58·4	+1·9	3·0
Chest breadth (cm.) ..	30·5	28·9	−1·6	3·1
Waist breadth (cm.) ..	29·7	27·9	−1·8	3·5
Chest depth (cm.) ..	22·9	21·2	−1·7	2·7
Endomorphy	3·8	3·2	−0·6	2·4
Mesomorphy	4·0	3·4	+0·6	2·3
Ectomorphy	2·9	4·2	−1·3	5·2

t is the ratio of the difference to its standard error.

There are very clear statistical differences, both in straight measurements and in the somatotypes. The research group is considerably more ectomorphic, and correspondingly rather lower in the other two components. The physical measurements, when surveyed in full, bear out this

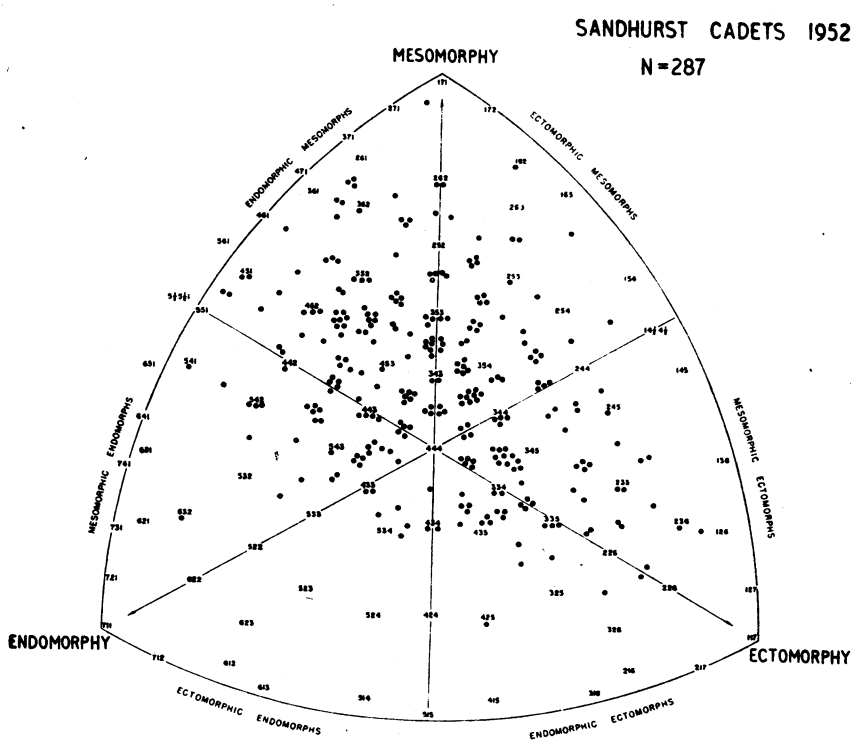

FIG. 2

Somatotype distribution of 287 officer cadets of the Royal Military Academy, Sandhurst. (From Tanner, 1953a.)

conclusion in detail. The two groups were closely comparable in age and in ethnic origins, and seemed to differ only in that more college graduates were in the research group than in the remainder. Accordingly Garn and Gertler measured also the executives of the factory, who were largely college-trained; but found these were very closely matched with the general plant physique and actually differed from the research group slightly more, rather than less, than did the general plant group. So the difference, as in the case of medical students and army officers, lies not so much in educational level, as in some deliberate choice of a preferred type of work.

The other groups that have been studied are criminals, delinquents and students. Hooton (1939), in an immense study of the morphology of some 17,000 prison and reformatory inmates, showed that significant differences in various measurements existed between those convicted of different sorts of crime. Lacking any very workable classification of physique, his study was more of a high-altitude aerial survey than a detailed map of the ground, but he did show, for example, that those persons who were in both the shortest one-sixth and the heaviest one-sixth of his population headed the list of crimes for rape and sex offences and assault but were lowest (of nine groups) in murder, whereas the converse extreme group of tall and slender criminals were first in murder and robbery, but lowest or next to lowest in burglary, assault and rape and other sex offences.

The study of juvenile delinquents by the Gluecks (1950) dealt with delinquents as opposed to non-delinquents only, but, with the advent of somatotyping, produced much more clear-cut and comprehensible results. Five hundred delinquent boys age eleven to eighteen were measured and somatotyped

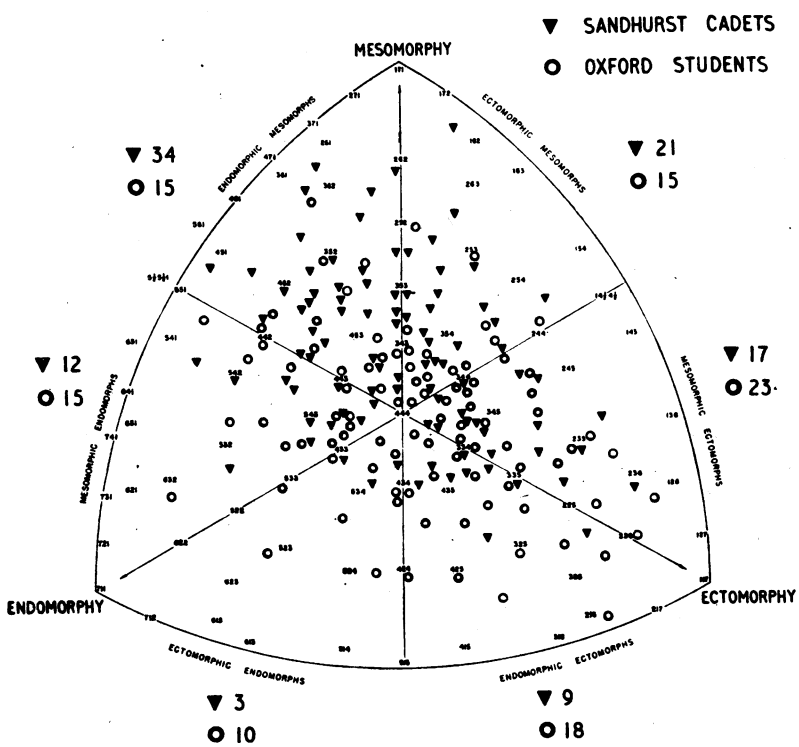

FIG. 3
Somatotype distributions of Oxford students and Sandhurst cadets compared.
(From Tanner, 1953a.)

by Dr. C. C. Seltzer (as part of a much wider sociological work-up) and compared with 500 non-delinquent controls carefully matched for age, general intelligence, ethnic origin and residence in underprivileged neighbourhoods. There emerged the clearest evidence, both from the statistical comparisons of measurements and from the somatotype comparisons (which are difficult at this age) that, although the two groups differed insignificantly in general body size, the delinquents were considerably more mesomorphic. They were also less in ectomorphy, with a lower $\mathrm{Ht.}/\sqrt[3]{\mathrm{Wt.}}$ ratio at each year of age from eleven to sixteen and over. There seemed to be less difference in endomorphy; the greater amount lay with the non-delinquents, but not by much. These differences, then, are in the same direction as those between the officer cadets and the Oxford students, a not altogether facetious comparison to which I shall return later. Sheldon, Hartl and McDermott (1949) and Epps and Parnell (1952), have also discussed physique in relation to delinquency.

Lastly, returning to students, there are three studies that should be mentioned, the latter two dealing with choice of faculty within a general university group. The first, by Woods, Brouha and Seltzer (1943) compared the ratings of potential excellence as an army officer made on Harvard University Officer Training Corps students by their officer instructors with their physique as determined by Seltzer. The only characteristic specifically considered was the masculine-feminine component of build* which is fairly closely related to mesomorphy. An association was found between masculinity of build and high ratings for officer excellence. Later Seltzer (1945) found that in 258 students studied under the auspices of the Grant Foundation at Harvard that there was a significant relation between choice of faculty and masculinity component. I have gathered together his figures and given them in Table 3, together with the appropriate statistical test. Evidently there is a predilection

TABLE 3

RELATION OF FACULTY CHOICE AND MASCULINE COMPONENT OF PHYSIQUE IN 258 HARVARD UNIVERSITY STUDENTS. DATA FROM SELTZER, 1945

	Masculine component: High	Masculine component: Low
Faculty choice		
Natural and social sciences	171	11 (6 per cent)
Arts, letters and philosophy	60	16 (21 per cent)

$\chi^2 = 11{\cdot}3$, $P = < {\cdot}001$

towards arts, letters and philosophy on the part of those low in physical masculinity (and hence also low in mesomorphy). The results of Terman and Miles (1936) on the relation of occupation and psychological masculinity should be compared with this.

Finally, there is a recent study by Parnell (1953) in this country, which is perhaps open to criticism on the ground that many of the somatotypes have been obtained in an unconventional and at present unwarranted manner, and also for its sketchy statistical treatment. The results nevertheless agree with the expectations derived from previous work; the chief finding is that students of engineering, dentistry and medicine are more mesomorphic and less ectomorphic than students of physics and chemistry.

To all these studies I would like to add one clinical impression and one serious though provocative remark. It seems to me that professional mathematicians, taken as a group, are more ectomorphic than most other academics; and I believe it would be most illuminating to see what assortment of physiques with specialisms occurred in the very wide spectrum of possible lives offered by the medical profession.

Discussion

So much then for the evidence that some relation exists between physique and choice of career. We must now discuss the possible ways in which this relation may arise. Let us go back for an example to the comparison of the more mesomorphic officer cadets with the more ectomorphic Oxford students.

The difference between these two groups might be due to the following causes:

* Tanner, 1951.

(*a*) Social background, i.e. early environmental effects.
(*b*) Self-selection by subjects (or subjects' parents) of their career.
(*c*) Institution selection, of those presenting themselves as candidates for entry.
(*d*) Physical changes after entry to the institution.

The social background certainly cannot account for the differences, since the small effect of social class on physique is in the opposite direction. The backgrounds of the officer cadets and Oxford students are fairly similar, but on the whole a greater proportion of the cadets are from the higher social classes. The effect of social class on physique probably continues to operate even with the Registrar-General's categories I and II but it is in the direction of the higher class being more ectomorphic, or at least having less weight for given height.* For the juvenile delinquents of the Gluecks, social class was carefully matched between the two groups; in Garn and Gertler's factory workers educational level, closely related to social class, was shown to have no effect; and in Seltzer's study of faculty choice social class and many other sociolo-ical variables were compared between the two groups without any significant differences emerging.

Physical change after entry to the institutions must be seriously considered for the Sandhurst-Oxford comparison, though it is irrevelant to the delinquent and to the student faculty-choice data. Even for the cadets, however, it must be rejected as responsible for more than a very small fraction of the differences observed. It is true that the cadets had for several weeks before measurement been taking more exercise than the students, but exercise of this variety has very little if any effect on muscular bulk and none whatever on the skeleton. Even the far more strenuous and effective exercise of weight-lifting, specifically designed to increase muscular bulk, has been shown to produce unspectacular and transient effects in young men, and to have had very little effect on anthroposcopic ratings of somatotype.†

The remaining two causes, self- and institution-selection are without doubt the main ones. The officer cadets and the students are both self- and institution-selected, and selected for differing attributes. These attributes are to a small extent physical and so very intimately linked with physique—the good games-player has a better chance of being accepted as an officer cadet and even, it is rumoured, as a medical student. But probably the chief differentiating attributes are psychological, in the sphere of temperament. The life and interests of an army officer differ from those of a doctor, and entrants to either profession go through the matching process I have mentioned before, equating the demands of their temperament with the opportunities for satisfying them that their projected career will give. It seems that the more ectomorphic men, on the whole, find at least the appearance of a satisfactory life more in medicine than in the Army; the more mesomorphic find the reverse.

These studies lend support, at least in a general way, to the findings of Sheldon and and Stevens (1942) on the relation of physique and temperament. Mesomorphy in physique is alleged to be related to a component of temperament called somatotonia, which is defined by high relative scores in such traits as assertiveness of posture, love of physical adventure, need for and enjoyment of physical exercise, love of power and domination over things and people, ruthlessness, physical courage, indifference to pain, aggression and assertiveness under the influence of alcohol, need of action when troubled, and love of the goals and activities of youth. This is the extraversion of action, and these are traits prized highly (though of course not exclusively) in the combat officer. Ectomorphy, on the other hand, is related, it is said, to temperamental cerebrotonia, defined as high scores in traits such as restraint in posture, love of

* Healy, 1952.

† Tanner, 1952b.

privacy, inhibited social address, self-consciousness, abhorrence of noisiness, hypersensitivity to pain, secretiveness of feeling, need of solitude when troubled and orientation towards the goals and activities of later periods of life. Cerebrotonia is practically the equivalent of Jung's introversion; and these traits do perhaps in fact distinguish the academic group; at least one can hazard the generalization that extreme cerebrotonia is as yet more acceptable than extreme somatotonia in a Senior Common Room of one of the older universities.

Then there is the fact that both combat officers and juvenile delinquents (and in later studies by Sheldon's group, adult criminals also) are comparable in being above average in mesomorphy. This is not in the least surprising, but it is instructive, and exemplifies well the relation I believe to exist between individual constitution and the group culture. For both careers some of the expectations of behaviour are the same—power, risk, action, crisis—; it is the *object*, in the psychoanalytical sense, towards which this energy is directed which is different. The somatotonic energy and drive, the need to express these traits of behaviour, is, I believe, fundamentally inborn, though certainly open to some moulding in childhood, and it is the sort of built-in, trammelled, energy, which the ethologists have investigated so beautifully in animal experiments.* It seems to me that somatotonia is probably as much an instinctual drive as mating behaviour, but that its objects are much less specific. Because of this, society can manipulate its expression far more than it can the expression of the mating drive; indeed it is the existence of drives with such variable goals that creates human society as we know it, and it is the particular manipulation of them that creates different cultures within that society.

The form of the factual results is also interesting because these occupational groups are subcultures, in the anthropological sense, which maintain themselves by attracting people whose temperamental needs they cater for, and by rejecting, forcibly perhaps, those whose view of the world is radically different. Such subcultures may come to wield great power inside the whole culture and may on occasion transform the whole culture into their own pattern. (cf. Morris, 1949). In this physical and temperamental differences between individuals lie as the pervading background even of economic and social history. Infinitesimally small in individual effect, they nevertheless provide the link which joins the laboratory study of the individual and the historical study of a culture to make the subject matter of human biology.

* Lorenz, 1952; Tinbergen, 1951, 1953.

Summary

We have ended up, I am afraid, far from our start, and perhaps I should close by returning you there, because there are surely some amongst you who are hard-minded and respect facts and decry speculation, even reasonable speculation. Let me bring back to mind then, that differences of physique have been observed by various research workers between occupational groups; that they cannot be explained by the effect of the occupation, or by social origins or by educational attainment. They represent a mixture of personal selection for the preferred way of life by the individual and individual-admission by a subculture to the group. The effect of this tendency on social patterns is, in a sense, obvious enough: without knowing the details of the process, it is perfectly plain that subcultures persist. But data like these, I believe, enable us to go into details, to back sociological truisms with a hard core of quantitative biology. It is in this way I believe that the science of human biology can contribute to our understanding of ourselves in our culture and bridge the immeasurably harmful gap that now yawns between the social and biological sciences.

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